Environmental Protection Agency

Horiba Emission Analysis System
NOx Efficiency Check Procedure

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NVFEL Reference Number

008A

Implementation Approval

Original Test Procedure Authorized by EPCN #217 on 02-05-99

Revision Description

(1) 12-13-95 The purpose of this change is to revise the procedure as described in EPCN #248.

(2) 09-18-2001 The purpose of this change is to update the Group Responsible name per EPCN #316

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Figures

Figures Continued

1. Purpose

The purpose of this working procedure is to describe the equipment and procedure required to perform a N0x efficiency check using the Horiba, Mexa Automotive Emission Analysis System.

2. Test Procedure

101 Activate the Horiba Series 7000 Bench according to WP 006, "Horiba Bench Startup." Additional information is also available in the Horiba "Series 7000 Users Guide."

Note: If you have an internal gas divider, skip Steps 102 and 103.

102 Get the gas divider. Connect the communications cable and all gas lines from the divider to the bench and ensure that the divider is connected to a power outlet.

103 Connect the numbered flexible quick-disconnect jumper lines between the MEXA Analyzer Rack (ANR) Gas Divider Panel and the Solenoid Valve Selector (SVS) of the bench under test.

104 Turn the Gas Divider (GDC) power on. The switch is in the back of the unit. Let the divider warm up for at least 30 minutes.

Line Number	Connection
1	Air
2	O_2
3	N_2
4	To GDC
5	From GDC

105 Go to the gas cylinder storage area outside the control room and disconnect the span gas line from the cylinder used on the range for the analyzer being checked.

106 Connect the span gas line to the "NOx 100 ppm Span Gas" cylinder as displayed on the line tag above the cylinder. Open the cylinder valve and set to 14 psi, if required. Note, for later use, the value of the bottle concentration on the cylinder tag.

107 On the upper portion of the Main Control Unit (MCU) display area, verify that the "Line" button displays the correct bench window.

If not, click on the "Line" button. See the arrow in Figure 1.

From the menu items that appear, click on bench X, where X = the bench number being calibrated. See the circle in Figure 1.

Figure 1
Command Screen

108 Click on the "NOx" button. See Figure 2.

Figure 2
N0x Button

109 From the menu items that appear, click on “Set span.” Click on “Set span” again.

When the “Span gas set” subpanel appears, click in the yellow field under “Span” in the row that is being used (R1 or R2). See the circle in Figure 3.

When the keypad display appears, use the mouse and on-screen keypad to click on “CE” to clear the data in the yellow-highlighted field.

Use the on-screen keypad to enter the bottle concentration from the cylinder tag that was noted in Step 105.

Verify that the entry is correct. If it is not correct, click on “CE” and enter the correct data. On the keypad, click on “OK.”

On the “Span gas set” screen, click on “OK.” See the arrow in Figure 3.

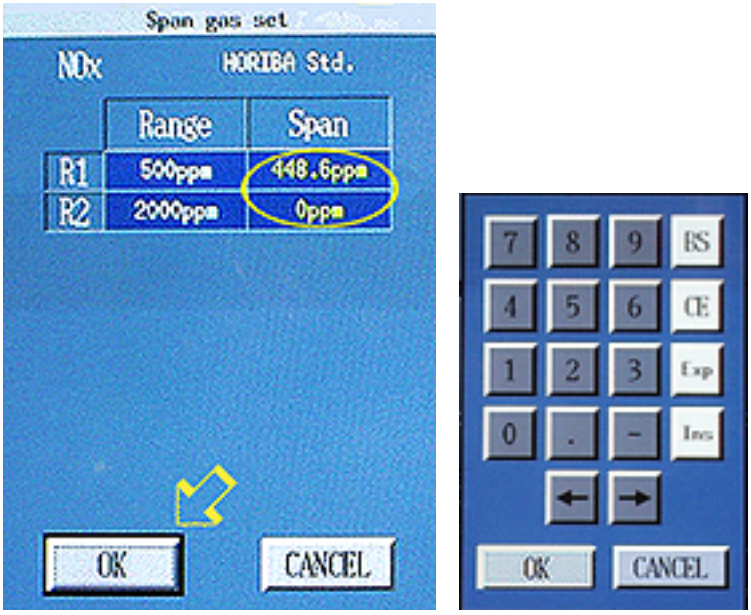

Figure 3
Span Gas Set

110 From the Main Control Unit (MCU) "Command Screen," Click on the Horiba logo button in the title bar. See the arrow in Figure 4.

From the menu items that appear below the button, click on "User Level." See the circle in Figure 4.

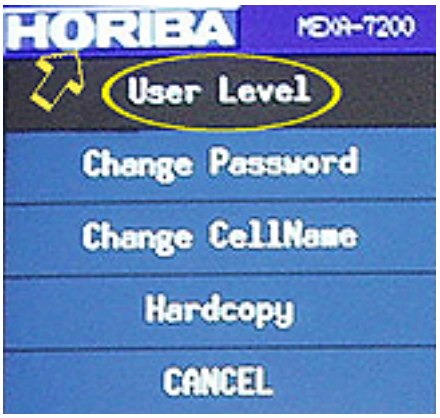

Figure 4
User Level

111 If "Supervisor" is not the top menu item in the display window, click on "Supervisor."

Use the mouse and on-screen keyboard to enter the password, then click on "Enter". See the arrow in Figure 5. "Supervisor" will appear at the top-center of the screen.

Figure 5
On-Screen Keyboard

112 On the display setup portion of the screen, click on the “Menu” button. See the arrow in Figure 6. From the menu items that appear, click on “Utility.” See the circle in Figure 6.

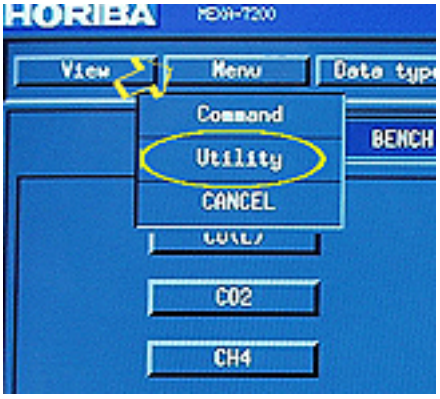

Figure 6
Utility Selection

113 At the bottom of the screen, click on “Checks/Tests” button. See Figure 7. From the menu items that appear, click on “NOx Eff Check.”

Figure 7
Checks/Tests Button

114 On the “NOx efficiency Menu,” click on the “General Parameter Setup” button. The “General Parameter Setup” panel will appear. See Figure 8.

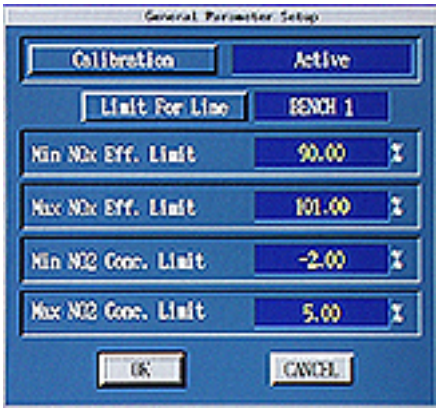

Figure 8
General Parameter Setup Panel

115 On the “General Parameter Setup” sub-panel: If “Active” is not selected in the “Calibration” button display window, click on the “Calibration” button. See the arrow in Figure 9. Select “Active.” See the circle in Figure 9.

Figure 9
Active” Selection

116 If the bench under test is not selected in the “Limit For Line” button display window, click on the “Limit For Line” button. See the arrow in Figure 10. Select the bench under test. See the circle in Figure 10.

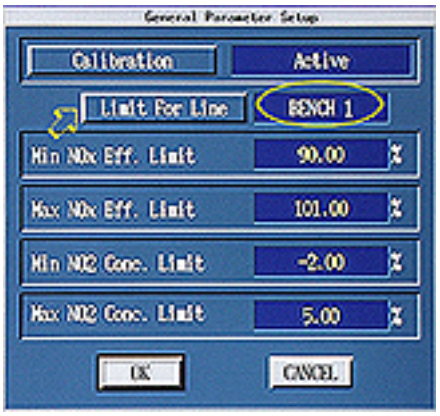

Figure 10
Limit for Line

117 Verify that the yellow field for “Min NOx Eff. Limit” displays “90.00.” If it doesn’t, click in the field. See the circle in Figure 11. Use the keypad to enter “90.00.”

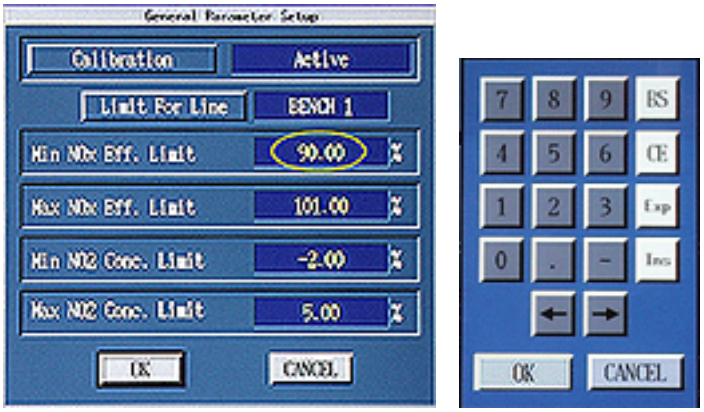

Figure 11
Min NOx Eff. Limit

118 Verify that the yellow field for “Max NOx Eff. Limit” displays “101.00.”

If it doesn’t, click in the field and use the on-screen keypad to enter “101.00.”

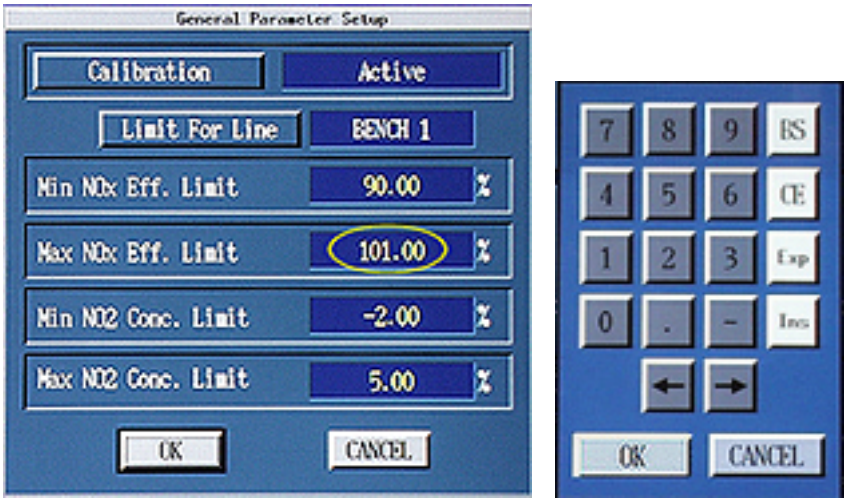

Figure 12
Max NOx Eff. Limit

119 Verify that the yellow field for “Min NO2 Conc. Limit” is "-2.00.” If it doesn’t, click in the field. See the circle in Figure 13. Use the on-screen keypad to enter “-2.00.”

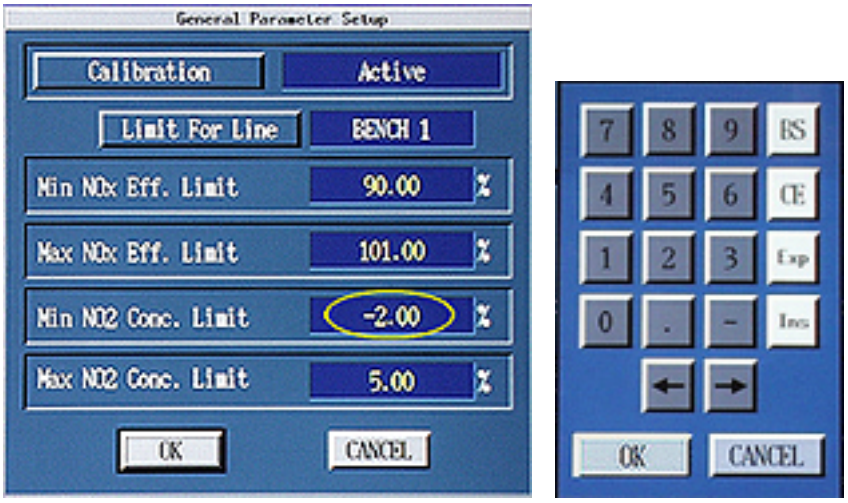

Figure 13
Min NO2 Conc. Limit

120 Verify that the yellow field for “Max NO2 Conc. Limit” label displays “5.00.” If it doesn’t, click in the field. See the circle in Figure 14. Use the on-screen keypad to enter “5.00.” On the keypad, click on “OK.” On the "General Parameter Setup" panel, click on "OK." See the arrow in Figure 14.

The “NOx efficiency Menu” will appear.

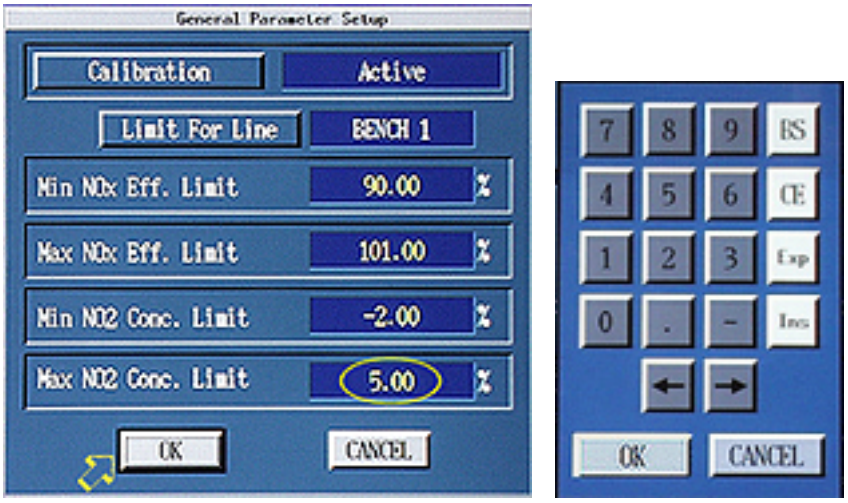

Figure 14
Max NO2 Conc. Limit

121 On the “NOx efficiency Menu,” click on the “NOx Efficiency Check” button.

122 Under “NOx Analyzer Selection” on the “NOx efficiency Check” panel, verify that the data is correct. To make a correction for “Line”, “Comp”, or “Range”, do the following:

Click on the “Line” button. See the arrow in Figure 15. From the menu items that appear, click on the bench under test (Bench 1, 2, or 3). See the circle in Figure 15.

Figure 15
Line Button

123 Click on the “Comp” button. See the arrow in Figure 16. From the menu items that appear below the button, click on “NOx.” See the circle in Figure 16.

Figure 16
Comp Button

124 Click on the “Range” button. See the arrow in Figure 17. From the menu items that appear below the button, click on the appropriate concentration, 500 ppm or 2500 ppm. See the circle in Figure 17.

Figure 17
Range Button

125 Click on the “Parameter Setup” button. See the arrow in Figure 18.

Figure 18
Parameter Setup Button

126 On the “Parameter Setup” screen:

For “Gas Supply,” verify that “Internal Gas to GDC” is selected. If not, click on the “Gas Supply” button. See the arrow in Figure 19. From the menu items click on that “Internal Gas to GDC.” See the circle in Figure 19.

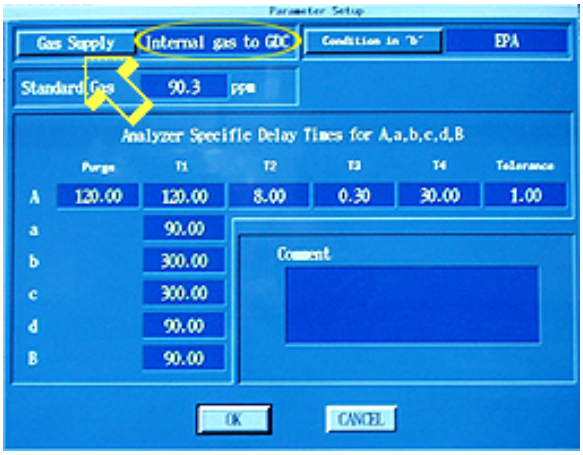

Figure 19
Internal Gas to GDC

127 Verify that “EPA” appears in the “Condition in ‘b’ ” display window.

If it does not, click-on “Condition in ‘b’.” See the arrow in Figure 20.

From the menu items that appear below the display window, click on “EPA.” See the circle in Figure 20.

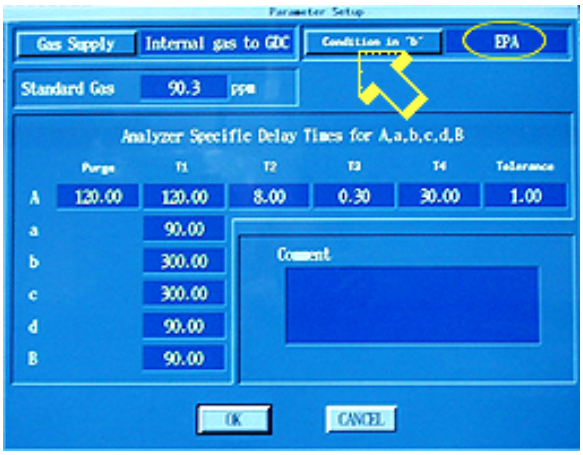

Figure 20
Condition in ‘b’ Window

128 Verify that the value of the bottle concentration on the cylinder tag noted in Step 104 appears in the “Standard Gas” field. See the circle in Figure 21.

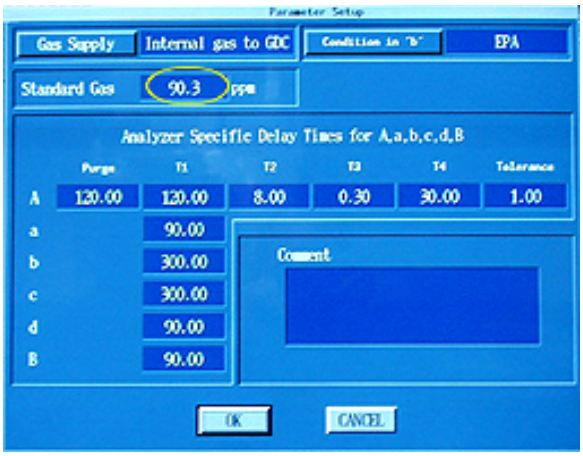

Figure 21
Standard Gas Field

129 If it does not, return to the “Set Span” screen and click in the yellow user changeable field. See the circle in Figure 22. Use the on-screen keypad to enter “the correct value.” See Step 107. On the keypad, click on “OK.” On the Span gas set panel, click on "OK." See the arrow in Figure 22.

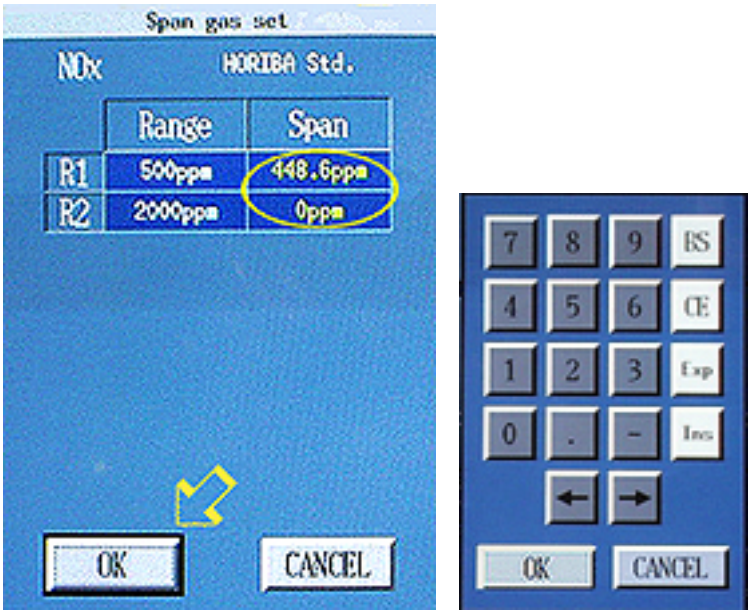

Figure 22
Span Gas Set

130 On the "Parameter Setup" menu, under “Analyzer Specific Delay Times for A, a, b, c, d, B,” verify that the yellow highlighted "Purge" field contains "60." See the circle in Figure 23. If not, click in the field and use the on-screen keypad to enter the correct data. See Figure 23. On the keypad, click on “OK.”

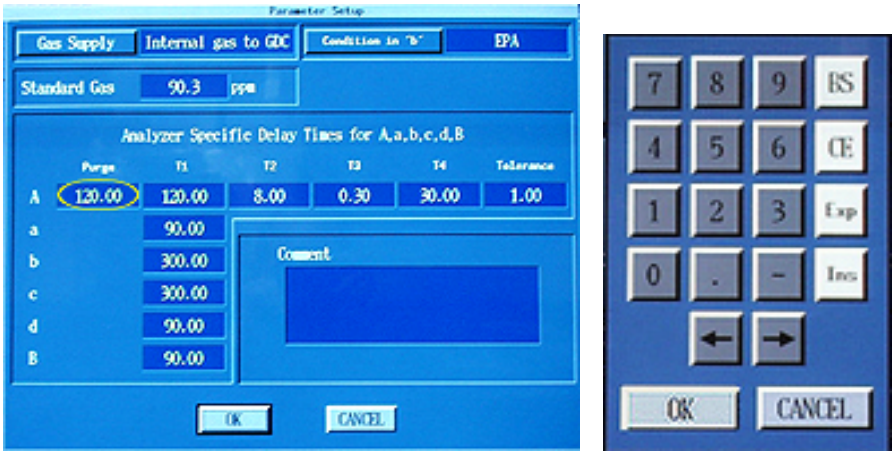

Figure 23
Parameter Setup for Purge

131 On the "Parameter Setup" menu, under “Analyzer Specific Delay Times for A, a, b, c, d, B,” verify that the yellow highlighted "T1" fields contain the following:

"A" "120.00." See the circle number 1 in Figure 24.

"a" "90.00" See the circle number 2 in Figure 24.

"b" "300.00" See the circle number 3 in Figure 24.

"c" "300.00" See the circle number 4 in Figure 24.

"d" "90.00" See the circle number 5 in Figure 24.

"B" "90.00" See the circle number 6 in Figure 24.

If the data is not correct, click in the incorrect field and use the on-screen keypad to enter the correct data. See Figure 24. On the keypad, click on “OK.”

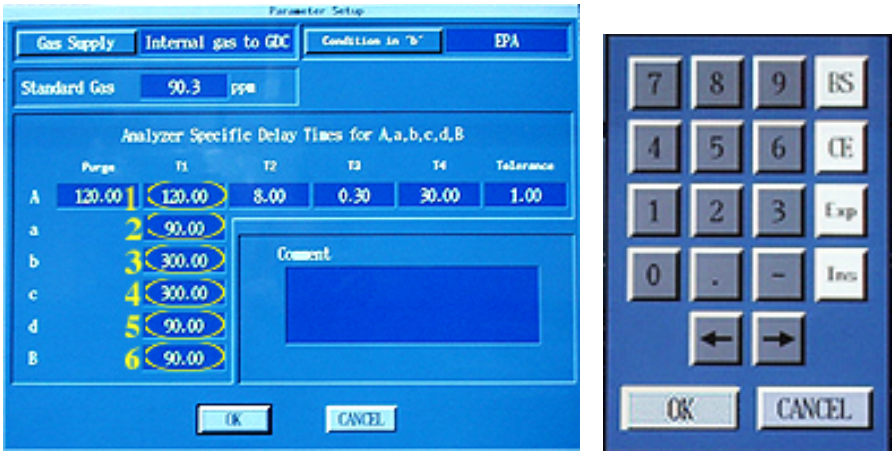

Figure 24
Parameter Setup for Tl

132 On the "Parameter Setup" menu, under “Analyzer Specific Delay Times for A, a, b, c, d, B”; “T2,” (8.00) cannot be changed, “T3,”(0.30) cannot be changed, “T4,” (30.00) cannot be changed, and “Tolerance,”(1.00) cannot be changed.

See Figure 25.

Click the “OK” button. See the arrow in Figure 25.

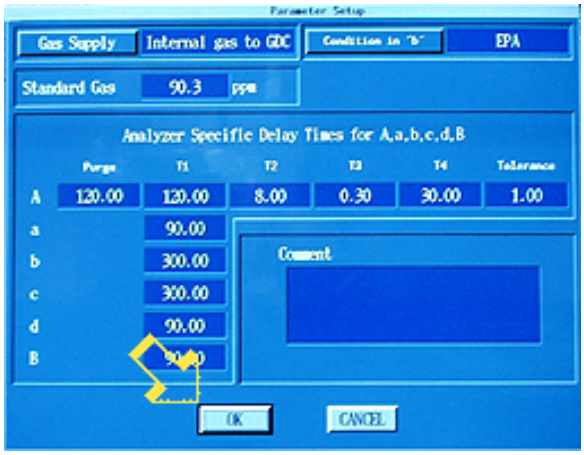

Figure 25
Parameter Setup Menu

133 When the “NOx efficiency Check” panel is displayed, verify that “Auto” appears in the “Mode” display window under “Test Control.”

If it is not displayed, click-on “Mode.” See the arrow in Figure 26. From the menu items that appear, click on “Auto”. See the circle in Figure 26.

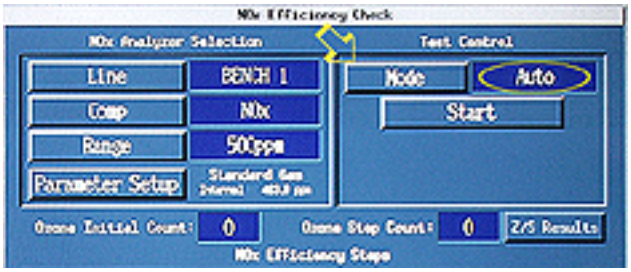

Figure 26
Mode Display Window

134 Verify that “200” appears in the “Ozone Initial Count” display window.

If it is not displayed, click in the yellow user changeable field for “Ozone Initial Count.” See the circle in Figure 27. Use the on-screen keypad to enter “200.” Click on “OK” to close the keypad. See Figure 27.

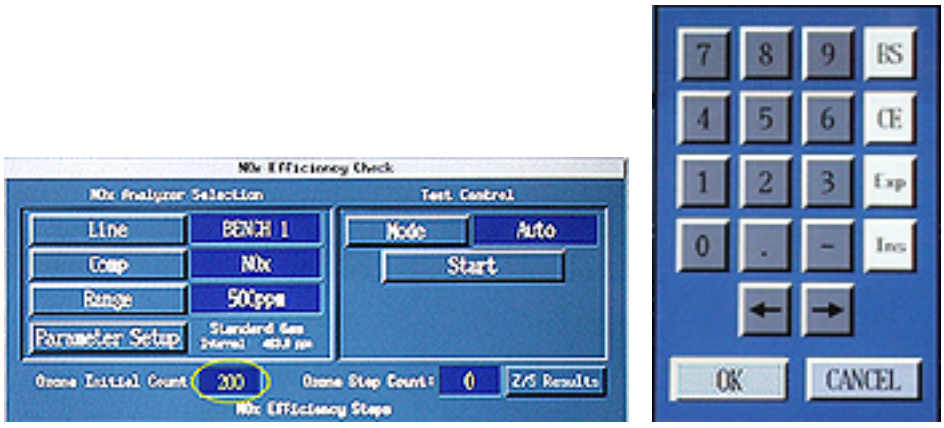

Figure 27
Ozone Initial Count Display Window

135 Verify that “20” appears in the “Ozone Step Count” display window.

If it is not displayed, click in the yellow user changeable field for “Ozone Step Count.” See the circle in Figure 28. Use the on-screen keypad to enter “20.”

Click on “OK” to close the keypad. See Figure 28.

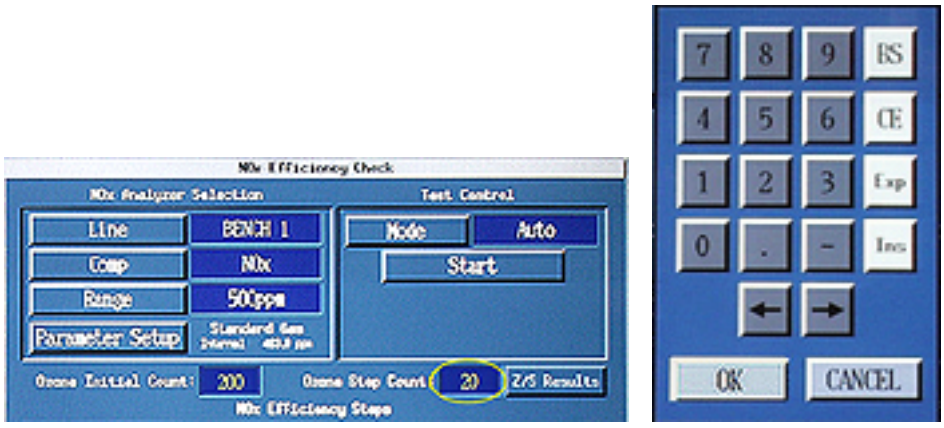

Figure 28
Ozone Step Count Display Window

136 Under “Test Control,” click on the “Start” button. See the arrow in Figure 29

Figure 29
Start Button

137 When the “Analyzer Calibration” panel appears, an automatic zero and span calibration of the analyzer will occur. The indicator flashes green during zero and flashes blue during span. See Figure 30.

If “Calibration failed” appears, click on the “Restart Cal” button. See arrow 1 in Figure 30.

When the zero and span calibration is completed, click on “Cancel.” See arrow 2 in Figure 30.

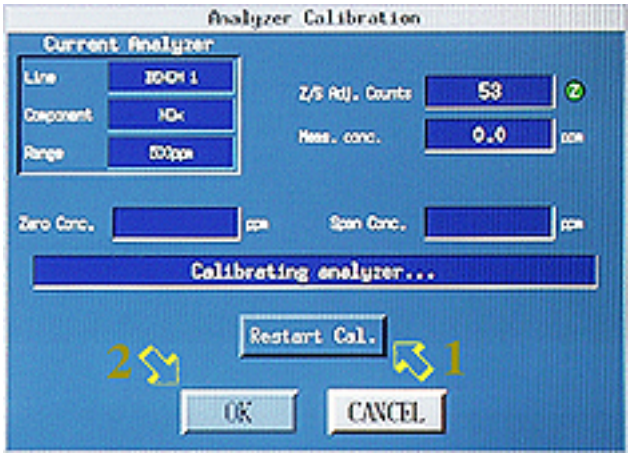

Figure 30
Analyzer Calibration Panel

138 When the test begins, a subpanel will appear. It will display the "Reading Step X" (where X = 1 through 6) number in the upper left corner. See Figure 31

Note: The process can be stopped at any time by clicking on "Cancel."

Figure 31
N0x Subpanel

139 When complete, the "Results" subpanel will automatically display the test results as "Pass" or "Fail." See the circle in Figure 32.

If the results "Status" displays "Fail", notify a PNGV senior technician and wait for instructions before proceeding.

If it displays Pass," click on "Cancel." See the arrow in Figure 32.

Figure 32
Results Subpanel

140 On the “NOx Efficiency Menu” subpanel, click on “Test Results.” On the "Test Results" Panel, verify that the date and time are correct. See the circle in Figure 33.

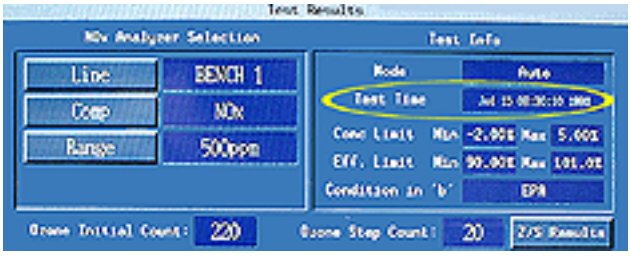

Figure 33
Test Results Panel

141 Click on the Horiba logo button. See the arrow in Figure 34.

From the menu items that appear below the button, click on “Hardcopy.” See the left-side circle in Figure 34 . Then select “Subpanel.” See the right-side circle in Figure 34.

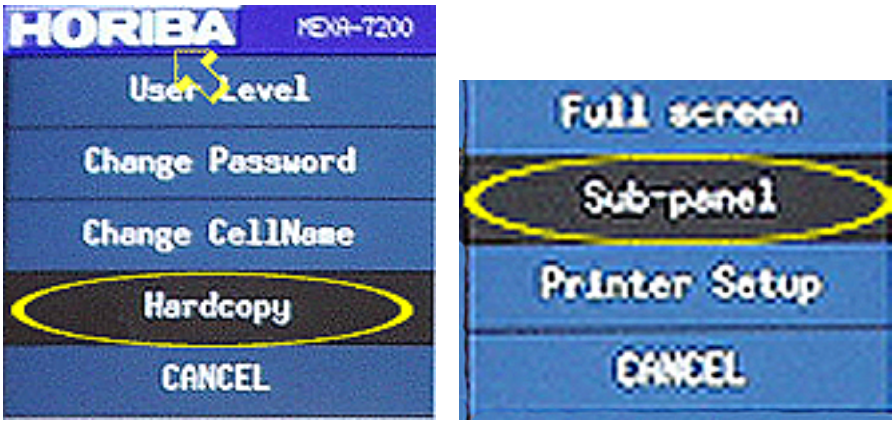

Figure 34
Hardcopy Subpanel

142 Click anywhere inside the “Test Results” subpanel. See Figure 35. A hardcopy of the NOx efficiency test results will print on the control room printer.

File the print-out in the diagnostics file.

Click on “Cancel.” See the arrow in Figure 35. The “NOx Efficiency Check" subpanel will appear.

Figure 35
Test Results

143 On the “NOx Efficiency Check" panel, click on “Cancel.” See the arrow in Figure 36.

Figure 36
NOx Efficiency Check Panel

144 Go to the gas cylinder storage area outside the control room and disconnect the span gas line from the “NOx 100 ppm Span Gas cylinder.”

145 Reconnect the line to the cylinder that was disconnected in Step 104. Open the cylinder valve. Note the value of the bottle concentration on the cylinder tag.

146 On the MCU “Command Screen” display area, click on “NOx” for the Analyzer under test. See Figure 37. Click on “Set Span.”

Figure 37
N0x Selection

147 When the “Span Gas Set” subpanel appears, click in the yellow user changeable field. See the circle in Figure 38. Use the on-screen keypad to enter “CE.” Then use the keypad to enter the bottle concentration data noted in Step 145. See Figure 38. Click on “OK.” See the arrow in Figure 38.

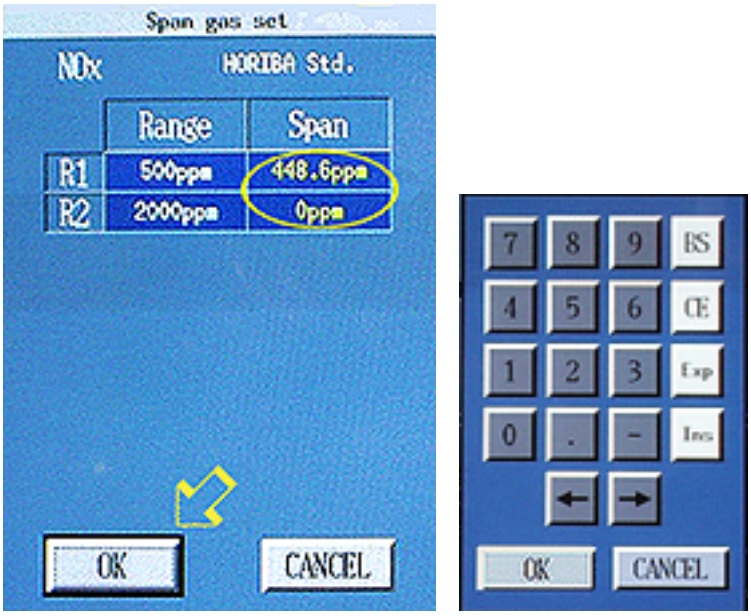

Figure 38
Span Gas Set Subpanel

148 Click on “NOx.” for bench X. Click on “Span”. Verify that the bottle concentration data corresponds to the value entered in Step 145.

If it does not, repeat Steps 141 and 142.

If after three attempts the bottle concentration data is not entered correctly, notify a PNGV senior technician and wait for instructions before proceeding.

149 Click on “NOx.” for bench X, then click on “Reset Cal.” Verify that the span value is approximately the concentration in Step 148.

150 Click on the “Menu” button. See the arrow in Figure 39. Then click on “Command.” See the circle in Figure 39.

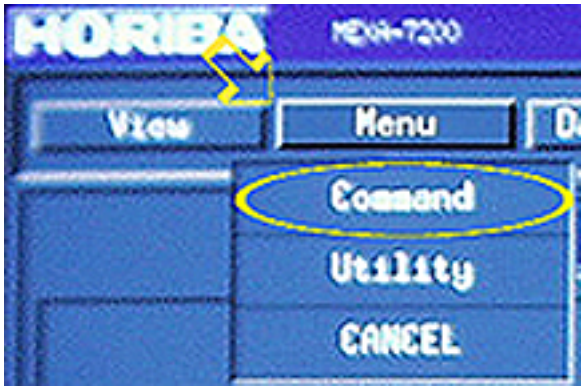

Figure 39
Command Selection

151 Click on “Horiba.” See the arrow in Figure 40. "Click on User Level" See the circle in Figure 40. From the menu that results, click on "Normal."

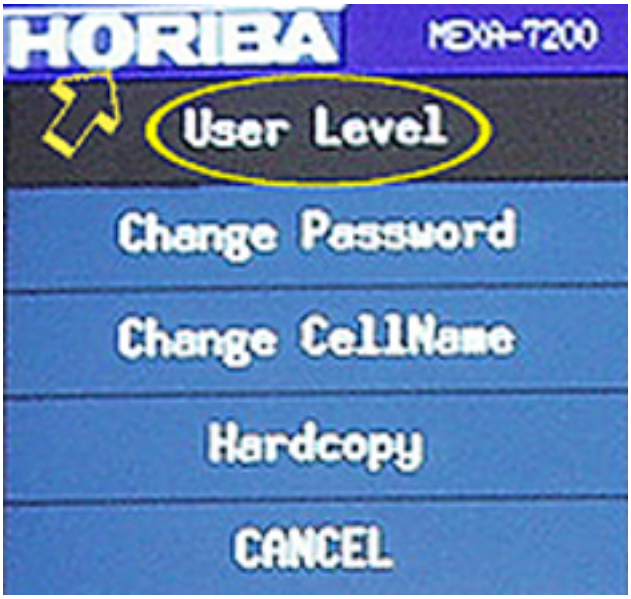

Figure 40
User Level Selection

3. Acceptance Criteria

3.1 The valve on the “NOx 100 ppm Span Gas” cylinder must be set to 14 psi.

3.2 The bottle concentration data from the “NOx 100 ppm Span Gas” cylinder must be entered on the Span Gas Set screen.

3.3 The "Min N0x Eff. Limit" field must display 90.00.

3.4 The "Max N0x Eff. Limit" field must display 5.00.

3.5 On the "Parameter Setup" menu, under “Analyzer Specific Delay Times for A, a, b, c, d, B,” the "Purge" field must contain "60."

3.6 On the "Parameter Setup" menu, under “Analyzer Specific Delay Times for A, a, b, c, d, B,” the "T1" field must contain "120.

3.7 “200” must appear in the “Ozone Initial Count” display window.

3.8 “20” must appear in the “Ozone Step Count” display window.

3.9 A zero and span calibration must be performed prior to the NOx efficiency check procedure.

3.10 The “NO2 Conc. Limit” shall not exceed 5%.

3.11 The “NOx Eff. Limit” shall be a minimum of 90%.